

**CLAIMS:**

1. A process for mercerising unconstrained  
cellulosic fibres comprising:
  - 5 transporting the unconstrained cellulosic fibres  
along a transit path through a mercerising zone, in which  
the unconstrained cellulosic fibres are contacted with a  
mercerising liquid followed by a rinsing zone, in which  
the unconstrained cellulosic fibres are rinsed;  
10 wherein the unconstrained cellulosic fibres are  
held to prevent longitudinal shrinkage during  
transportation through both zones.
2. The process of claim 1, wherein the  
15 unconstrained cellulosic fibres are raw fibres, carded  
fibres, slivers or rovings.
3. The process of claim 1, wherein the  
unconstrained cellulosic fibres are in the form of a  
20 sliver.
4. The process of any one of claims 1 to 3, wherein  
the fibres are held to retain the fibre length during the  
entire sequence of the mercerising step followed by the  
25 rinsing step, including the passage between the two steps.
5. The process of any one of claims 1 to 4, wherein  
the unconstrained cellulosic fibres are held by being  
compressed between two surfaces as they travel along the  
30 transit path.
6. The process of claim 5, wherein the cellulosic  
fibres are transported along the transit path between a  
pair of belts which are pressed together in a plurality of  
35 positions through the transit path.

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7. The process of any one of claims 5 and 6, wherein the fibres are stretched during transportation through the mercerising and rinsing zones.

5 8. The process of claim 7, wherein the degree of stretching is about 4% or less.

9. The process of any one of claims 7 and 8, wherein the belt is slightly elastic and placed under  
10 tension through the mercerising and rinsing zones.

10. The process of any one of claims 7 to 9, wherein the unconstrained cellulosic fibres are oriented.

15 11. The process of any one of claims 6 to 10, wherein the transit path includes nip rollers at the beginning and end of the transit path, which place the belts under tension through the two zones therebetween.

20 12. The process of any one of claims 6 to 11, wherein the belts pass over guide means at a number of points along the transit path.

13. The process of claim 12, wherein the straight  
25 path length between the points at which the belt is in contact with a guide means is in the range of the average length of the cellulosic fibres or less than this distance.

30 14. The process of claim 13, wherein the straight path length is less than 2.8 cm.

15. The process of any one of claims 12 to 14, wherein the guide means are rollers.

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16. The process of claim 15, wherein the diameter of the rollers is less than two times the average length of

the fibres being treated.

17. The process of claim 15, wherein the diameter of the rollers is less than 1.5 times the average length of the fibres being treated.

18. The process of any one of claims 15 to 17, wherein the transit path is a circuitous path that winds around the rollers.

19. The process of any one of claims 12 to 18, wherein nip rollers are provided in the region between the mercerising zone and the rinsing zone to squeeze excess mercerising liquid out of the fibres and belts.

20. The process of any one of claims 6 to 19, wherein the belts are driven by a pad mangle at the end of the transit path which pulls the belt through the transit path.

21. The process of any one of claims 1 to 20, wherein the cellulosic fibres are transported through additional zones after rinsing.

22. The process of claim 21, wherein the cellulosic fibres are conveyed through a neutralising zone in which the cellulosic fibres are neutralised with a neutralising liquid.

23. An apparatus for mercerising unconstrained cellulosic fibres, the apparatus comprising:

- (i) a mercerising zone;
- (ii) a rinsing zone following the mercerising zone;
- (iii) a conveyor comprising a pair of surfaces for holding the unconstrained cellulosic fibres to prevent longitudinal shrinkage during transportation of the unconstrained cellulosic

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fibres along a transit path through the mercerising zone and the rinsing zone;

(iv) driving means for driving the conveyor; and

5 (v) pressure means for pressing the surfaces of the conveyor together in the mercerising zone and the rinsing zone to thereby hold the unconstrained cellulosic fibres so as to prevent longitudinal shrinkage of the fibres through the zones.

10 24. The apparatus of claim 23, wherein the apparatus includes a neutralising zone following the rinsing zone.

15 25. The apparatus of claim 23 or claim 24, wherein the conveyor is configured to enable the unconstrained cellulosic fibres to be held to prevent longitudinal shrinkage throughout the mercerising zone, the rinsing zone and the passage between these two zones.

20 26. The apparatus of any one of claims 23 to 25, wherein the conveyor comprises a pair of belts.

25 27. The apparatus of claim 26, wherein the belts are under tension so that, in use, a compression force is maintained on the fibres to hold them firmly and thus prevent longitudinal shrinkage.

30 28. The apparatus of claim 27, wherein the belt is slightly elastic so that, in use, an assembly of aligned, unconstrained cellulosic fibres fed between the belts are subjected to a stretching force by the belts in the mercerising and rinsing zones.

35 29. The apparatus of any one of claims 26 to 28, wherein the pressure means includes at least two pairs of nip rollers, one pair of nip rollers being located at the end of the mercerising zone, to squeeze out excess

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mercerising liquid, and the other pair being located at the end of or following the end of the rinsing zone.

30. The apparatus of any one of claims 26 to 29,  
5 wherein the straight distance between the points at which the belts come into contact with pressure means ("path length") along the transit path is in the range of the average length of the cellulosic fibres to be treated in the apparatus, or less than this distance.

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31. The apparatus according to claim 30, wherein the path length is less than 2.8 cm.

32. The apparatus of any one of claims 26 to 31,  
15 wherein the pressure means includes a plurality of rollers located along the transit path in the mercerising zone and the rinsing zone.

33. The apparatus of claim 32, wherein the  
20 diameter of the rollers is less than two times the average length of the fibres to be treated in the apparatus.

34. The apparatus of claim 32 or 33, wherein the  
25 transit path is a circuitous path that winds around the rollers, and there are approximately equal numbers of left- and right-hand curves around the rollers in the transit path.

35. The apparatus of any one of claims 26 to 34,  
30 wherein the drive means is in the form of a mangle at or downstream of the end of the transit path.

36. The apparatus of any one of claims 23 to 35,  
wherein the mercerising zone includes a mercerising bath  
35 for containing a mercerising liquid, the rinsing zone including a rinsing bath for containing a rinsing liquid.

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37. An apparatus for treating fibres, comprising:  
a treatment zone;  
a conveyor comprising a pair of surfaces for holding the  
5 fibres to be treated to prevent shrinkage of the material  
through the treatment zone;  
driving means for driving the conveyor; and  
pressure means for pressing the surfaces of the conveyor  
together to hold the fibres to prevent shrinkage of the  
10 fibres.

38. Product produced by the process of any of claims  
1 to 22 or in the apparatus of any one of claims 23 to 37.